




Division of Agricultural Sciences  
UNIVERSITY OF CALIFORNIA

A vertical column of six stylized grape leaves, each with a detailed vein pattern and a serrated edge, running down the center of the page.

# GRAPE PESTS IN SOUTHERN CALIFORNIA

MARTIN M. BARNES

CALIFORNIA AGRICULTURAL  
Experiment Station  
Extension Service

**CIRCULAR 553**

THIS CIRCULAR describes all potentially damaging species of insects and mites found in southern California vineyards. Particular emphasis is given to the most important of these pests, the variegated grape leafhopper. Recommendations for specific insecticides used in control are not given (they are available at your local Farm Advisor's office), but methods and timing of control practices based on research in local vineyards are explained.

Fig. 1. Mature variegated grape leafhoppers are about 1/8-inch long; the color markings of the insects are brown, green, red, white, and yellow.



MARCH, 1970

**THE AUTHOR:**

M. M. Barnes is Professor of Entomology and Entomologist in the Experiment Station, Riverside.

# GRAPE PESTS IN SOUTHERN CALIFORNIA

## THE VARIEGATED GRAPE LEAFHOPPER

The variegated grape leafhopper, *Erythro-neura variabilis* Beamer, is the principal insect pest and the only leafhopper found in large numbers in southern California vineyards. Infestations are especially severe in the Coachella Valley because high average temperatures there allow rapid development of the pest, and also because favorable overwintering quarters are abundant. The latter factor probably accounts for the distribution of high leafhopper populations in San Bernardino County vineyards. In vineyards located over 2 miles from suitable overwintering quarters, treatments may not be required. Overwintering adult leafhoppers must have access to green vegetation from which they obtain water; without such access they soon die.

### Seasonal development and control in the Coachella Valley

Adult leafhoppers successfully overwinter in large numbers in windbreaks of tamarisk, bamboo, and eucalyptus, in citrus

orchards and hedgerows of pyracantha and oleander, in grain fields, and on desert plants such as sagebrush. They are especially numerous in winter on bermudagrass in date gardens. Movement into vineyards begins soon after vine growth begins in spring. Because there are six generations a year, chemical control is essential. When adult insects are numerous they may interfere with harvesting by annoying the pickers; nymphs are chiefly responsible for the black spotting of grapes which strongly detracts from market value as fresh fruit (spotting results from development of sooty mold on excreted honeydew).

First opportunity for pre-harvest control. Where large populations of overwintering leafhoppers invade vineyards annually in early spring, a control application should be applied when egg-laying begins. In the Coachella Valley the first eggs are inserted within grape leaves about 14 days after the leafhoppers move into the vineyard. Because many leafhoppers have not at this time moved into the vine-

## TYPICAL EARLY SEASON DEVELOPMENT OF VARIEGATED GRAPE LEAFHOPPERS IN THE COACHELLA VALLEY

First movement of overwintering adult leafhoppers into vineyard .....	March 7-15
First oviposition .....	March 21-30
Best time for treating vineyard and adjacent windbreaks for overwintering leafhoppers.....	April 5
First generation egg hatch begins.....	April 7-15
First generation adults appear.....	May 10
Second opportunity for pre-harvest control* .....	May 15-25
First generation egg hatch practically complete.....	May 25
First generation adults at high population level .....	June 1-10
Second generation nymphs present in large numbers and spotting fruit .....	June 1-25

\* No treatment required if overwintering adults have been adequately controlled.



yard from their overwintering quarters, the first treatment should also be applied to all vegetation immediately adjacent to the treated vineyard. If good control of overwintering adults in and immediately adjacent to the vineyard is obtained at the time egg-laying begins, and if the vineyard is not subject to gross reinfestation from adjacent untreated vineyards, an additional treatment is not required until the post-harvest period.

Eggs of the first generation begin to hatch 18 to 21 days after egg-laying begins, and oviposition and hatch of this generation continue for about 6 to 7 weeks. Before the first generation hatch is completed, some of its adults have matured and laid eggs.

**Second opportunity for pre-harvest control.** Another opportunity for good control comes when the first generation hatch is almost completed and the second generation hatch is beginning. In the Coachella Valley, this usually occurs between May 15 and May 25 when there is a relatively low population of adult leafhoppers because mortality of overwintering adults is complete and development of new adults has just begun. The population of mature first generation nymphs will be high, however, and the yellow- to yellowish-brown nymphs will be found on lower surfaces of the first 6 to 8 leaves at the base of the canes. Comparatively few if any will be found on younger leaves farther out, or on the periphery of the vine; examination of these outer leaves in mid-May thus will be misleading as regards leafhopper populations. If left uncontrolled the nymphs produce first generation adults; these produce second generation nymphs, which will be numerous in the vineyard before and during harvest when spotting of grapes with honeydew occurs.

**Post-harvest treatment.** One post-harvest treatment for leafhoppers is generally required to prevent partial midsummer defoliation of vineyards in the Coachella Valley. At mean temperatures of 90°F, the insect completes one generation in 28 days—62 days are required at 70°F. Because each female can lay as many as 75 eggs, and because there are six generations yearly, the possibility of extremely high



Fig. 2. Nymphs of the variegated grape leafhopper shown on undersurface of a leaf.

populations of the insects in desert vineyards is great. About four generations develop after harvest is complete.

## Seasonal development and control in San Bernardino County

Here, leafhoppers overwinter in native stands of vegetation and in windbreaks and citrus orchards. Vineyards distant from foothill districts without favorable overwintering quarters do not require treatment for leafhopper control in some seasons. Development of leafhoppers is considerably slower, and there are fewer generations annually than in the Coachella area. Oviposition begins about 20 days after leafhoppers are first observed in the vineyard; if treatment is effectively applied at that time, and if there is no gross reinfestation from adjacent untreated vineyards, no further treatment is usually required during the season.

The egg parasite, *Anagrus epos* Gir., is

found in late summer in significant numbers in the vineyards within a short radius of the foothill chaparral. The

potential of this parasite in natural control of the variegated grape leafhopper is not understood at present but is under study.

## SUPPLEMENTARY INFORMATION ON CONTROL OF GRAPE LEAFHOPPERS

**Pre-bloom treatments.** Spray applications applied with ground equipment (25 to 50 gallons per acre) give better control than dusts, and may be used under a wider range of weather conditions. For satisfactory results, dust applications should be made when the air is still.

**Post-bloom, pre-harvest treatments.** Post-bloom, pre-harvest spraying of table grapes may result in black spotting of the fruit if emulsifiable or solvent formulations of insecticides are used. Therefore, wettable powder formulations are preferred for spraying. Safe materials must be used if people are to work in the vineyards soon after spraying.

**Post-harvest treatments.** Post-harvest spray treatments for grape leafhopper in the Coachella Valley generally require a higher gallonage than the pre-bloom treatments. Use 50 to 75 gallons per acre.

## BUD BEETLES

The grape bud beetle, *Glyptoscelis squamulata* Crotch, is about 5/16-inch long and is covered with a light-gray pubescence. It emerges from the ground in the Coachella Valley in late February and begins feeding on buds as soon as they begin to swell. The pest is active at night, and usually eats out a cylindrical core in the developing bud, beginning at the tip. During the day, beetles hide under loose bark of the vine or in trash at the vine's base. Eggs are deposited under the bark and larvae develop in soil on the vine roots, causing no apparent damage. At one time damage caused by this insect was severe enough to greatly limit grape planting in the Coachella Valley, and natural controls were completely ineffective. However, damaging populations of grape bud beetles in that area have virtually disappeared as a result of application of insecticides, and

in most vineyards treatments are not required annually.

In vineyards which have suffered significant bud damage from bud beetles during the previous season, a population is probably present and thus treatment should be applied when bud swelling begins. All vineyards should be examined for signs of feeding when buds are swelling; after shoots are an inch or two long feeding is negligible. Necessary spray applications should be directed at the trunks and arms of the vines, and at the stakes.

Two species of small darkling ground beetles, *Metoponium abnorme* Lec. and *Coniontis parviceps* Csy., are occasionally found attacking buds in vineyards in the Coachella Valley. Corrective treatments (though seldom required) are the same as for the grape bud beetle.

## CUTWORMS

The variegated cutworm, *Peridroma saucia* (Hübner), the black cutworm, *Agrotis ipsilon* (Hufnagel), and other cutworms,

*Euxoa* sp., are nocturnal feeders on grape buds; in the daytime they are found in the soil. They are frequently damaging during



Fig. 3. Mature black cutworm, a night-feeder on buds.

bud swell in San Bernardino County vineyards. In late winter and early spring cutworm populations develop on grass and weeds in vineyards, and they often move to the vines and eat large holes in the swelling buds. It is not advisable to reduce weed cover crops or to remove vegetation from around the base of the vines when

buds are swelling, as destroying weed hosts at this time leaves only grape buds for the cutworms to feed on. However, a thorough reduction of the weed cover a month before bud swell will greatly reduce cutworm populations. (This is not a recommended practice in areas where there is wind erosion of the soil in early spring.)

To check on vineyard cutworm population shortly before bud swell, use a knapsack duster to treat blocks of 10 vines each in several locations with an appropriate insecticide dust. Treat grass and weed cover crops adjacent to vines, and check treated areas early on the morning after treatment before birds remove the dead cutworms—where large numbers of dead cutworms are found, treat that entire section of the vineyard.

Power dusters may be used for over-all cutworm control; best results are obtained when a cover crop of some weed growth is present to hold the dust deposits. For localized infestations, a knapsack-duster application may be used on vine trunks and stakes and on soil around them—this provides an insecticide deposit over which cutworms must crawl to feed on buds. Sprays and baits are also effective.

## THE WHITE LINED SPHINX MOTH

Larvae of the white lined sphinx moth, *Celerio lineata* (Fab.), occasionally develop in large numbers on native weed hosts in uncultivated areas near vineyards. Larvae are approximately 3 inches long when mature, and are bright green or (occasionally) black, with a posterior yellow horn. They are often abundant in heavy stands of sand verbena and other plants following favorable winter rains in the Coachella Valley. When wild host plants are no longer suitable to feed on in early spring, the larvae may migrate into vineyards and defoliate the vines. To prevent this, a heavy application of insecticide dust should be applied to the bottom of a ditch across the path of migration. The ditch should be approximately 15 inches deep, with its steep side toward the vineyard. Renew the insecticide as required.



Fig. 4. Larva of the white lined sphinx moth.



## THE ACHEMON SPHINX MOTH

The achemon sphinx moth, *Pholus achemon* (Drury), is a resident pest in the vineyard and develops entirely on vines. Larvae may be distinguished from those of the white lined sphinx by the fact that the achemon sphinx larvae have 6 or 8 diagonal white stripes along their sides. They are green, brown, or various shades of red, and mature larvae do not have a

posterior horn. The larvae may be fairly numerous during the post-harvest period in many Coachella Valley vineyards, but seldom cause significant damage. Their numbers are often reduced by leafhopper control treatments. Special insecticide applications may occasionally be required in young vineyards to prevent defoliation and allow normal establishment of vines.

## THE WESTERN GRAPE LEAF SKELETONIZER



Fig. 5. Various larval stages of the western grape leaf skeletonizer.

Infestations of the western grape leaf skeletonizer, *Harrisina brillians* B. & McD., in southern California have been confined to the western sections of San Diego County. The introduction of parasites, and the effects of a larval virus disease have markedly reduced populations of this insect. The adult moth, a daytime flyer, is about  $\frac{5}{8}$  of an inch long and of a metallic blue-black color. The larvae feed side by side in colonies on the lower surface of the leaf. Young larvae eat all the leaf except veins and upper cuticle; older larvae skeletonize the leaves, leaving only the larger veins. Older larvae are bright yellow and have two purple and ten black transverse bands of tufted hair.

Completely exposed leaf feeders are seldom found as pests in vineyards receiving treatments for other insects. Infestations may develop in untreated vineyards or dooryard vines, and these should be examined for first generation larvae during the second or third week in June. Localized treatment will usually suffice if significant defoliation is threatened. A second application may be required if significant numbers of second generation larvae are present during the last week of July.

## THE FALSE CHINCH BUG

The false chinch bug, *Nysius raphanus* Howard, is a pre-bloom pest of vines in certain areas in southern California. This insect is about  $\frac{1}{8}$  inch in length and is

gray and black; its nymphs often attack vines in the same parts of a vineyard year after year. These infestations develop in those areas where London-rocket (a mus-

tard-like weed) has been permitted to develop in late winter as a volunteer cover crop. Overwintering false chinch bug adults are strongly attracted to London-rocket and may gather in large numbers. The resultant large nymphal populations will attack grape vines when the weeds dry up and are no longer suitable to feed upon; such heavy infestations completely kill back new vine growth. If false chinch bugs have been a problem, stands of London-rocket should be disked under or otherwise reduced about 3 weeks before grape vines leaf out. Insecticides must be applied to the weeds if high populations are found in them after vines leaf out, because disking at this time will result in heavy movement from weeds to vines.

## THE YELLOW WOOLLYBEAR

Yellow woollybear caterpillars may occasionally be found in significant numbers in early spring in vineyards of San Bernardino County. Larvae of this species, *Diacrisia virginica* (Fabr.), are 1½ to 2 inches long when mature, are hairy, and are straw yellow with transverse black lines. These larvae develop on weed hosts and move to the vines where they cause much damage to leaves if present in large numbers. Localized treatments with insecticides are occasionally warranted if defoliation is threatened.

## THRIPS

The citrus thrips, *Scirtothrips citri* (Moulton), may infest new vine growth in the Coachella Valley. Thrips populations high enough to distort tip growth are most often found in midsummer and fall. On mature vines this late season feeding injury is not sufficient to warrant treatment, but if tip growth on young vines is affected control may be required. Occasionally, thrips may scar developing grapes in the first few vineyard rows adjacent to citrus plantings. Corrective treatments may be locally required if citrus thrips are found in grape flower clusters. Citrus thrips adults are smaller, yellower, and more

active than flower thrips. The abdomen of the citrus thrips abruptly narrows posteriorly, while the flower thrips tapers more evenly. Adult citrus thrips have no spines at the front angles of the pronotum (the top of the first segment behind the head) while the flower thrips has two.

Adult western flower thrips, *Frankliniella occidentalis* (Perg.), are often found associated with blossoming grapes in the Coachella Valley, and with developing clusters during the post-bloom period. Damage from this species in this area has not been observed, and treatments are not believed to be warranted on grape varieties grown in the Coachella Valley.

## TERMITES

The western drywood termite, *Incisitermes minor* Hagen, frequently infests dead heartwood of grapevines in San Bernardino County; in fact, nearly all vines in the older vineyards of the area show signs of infestation by this species. Living sapwood of old vines is not invaded, and injury is confined primarily to weakening of the vine's structure so that arms and trunks may be broken off rather readily. Control measures do not appear to be practicable.

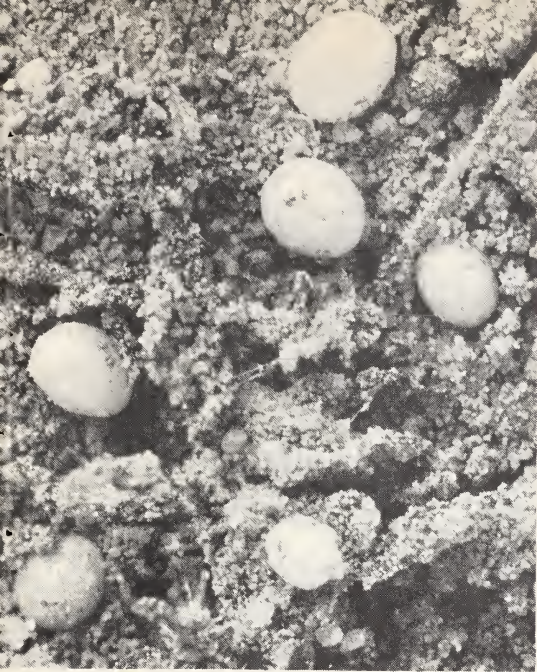
In the Coachella Valley, the western subterranean termite, *Reticulitermes hesperus* Banks, is occasionally found in the heartwood of older vines.

Termite damage to grapestakes may be prevented by using termite-resistant wood, such as redwood or eastern cedar heartwood, or by using wood which has been pressure-treated with a chemical to prevent termite attack (cut-ends of stakes must also be treated).

## GROUND PEARLS

The ground pearl, *Margarodes meridionalis* Morr., is a scale insect found on roots of grapevines in the Imperial Valley. It is widespread on roots of bermudagrass in that area, and is particularly abundant on roots of bermudagrass along irrigation canals. High populations of the insects





have been found on roots of grapevines planted in sandy soils, but not in roots in heavy clay soil. The pre-adult female is a globular cyst found attached to rootlets; it attains a diameter of approximately  $\frac{3}{16}$ -inch and is covered with a glassy covering of a pearly, faintly yellowish-green color (hence the name ground pearl). The insect should be considered a potential pest of sandy-soiled vineyards in the Coachella Valley, although infestations have not spread to that area.

Fig. 6. Ground pearls.

## ERIOPHYID MITES



The grape rust mite, *Calepitrimerus vitis* (Nalepa.), is an eriophyid mite scarcely visible to the naked eye. It overwinters under bud scales and moves to new growth in spring, feeding predominantly on lower surfaces of leaves. Occasionally, high populations on young leaves cause clearing of the smallest leaf veins and leaf distortion. Mite populations developing later in the season on the under surface of mature leaves result in premature yellowing of foliage of white grapes, and in premature red coloration of foliage of dark varieties in midsummer. Sulfur applied for mildew control usually reduces populations of this mite.

The grape erineum mite, *Eriophyes vitis* (Pagenst.), is occasionally encountered on dooryard vines which do not receive sulfur treatments for mildew control. It forms reddish galls on the upper surface of the leaf, and the microscopic mites are found in the dense growth of leaf hairs on the under surfaces. A bud strain of this mite lives exclusively within the buds but has not been shown to cause significant injury in California vineyards.

Fig. 7. Rust mite injury to young grape leaf.

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture,  
University of California, and United States Department of Agriculture co-operating.  
Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914.  
George B. Alcorn, Director, California Agricultural Extension Service.

Co-operative Extension work in Agriculture and Home Economics, College of Agriculture, University of California, and United States Department of Agriculture co-operating. Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914. George B. Alcorn, Director, California Agricultural Extension Service.







**T**his publication is one of many that are written, produced, and distributed by the University of California Division of Agricultural Sciences.

**T**hey cover many subjects, from agronomy to zoology. They cover many crops, from alfalfa to zucchini. Some report new research findings... some tell "how to do it."

Most are free... for some there is a charge.

All are listed in a catalog that is issued annually.

**T**o get a copy of the catalog, visit the office of your local University of California Farm Advisor, or write to:

Agricultural Publications  
University Hall  
University of California  
Berkeley, Calif. 94720